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Perceptual judgments of nasal resonance.

Phyllis L. Debertin
The University of Montana

PERCEPTUAL JUDGMENTS OF NASAL RESONANCE

by

Phyllis L. Debertin

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TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

"Hypernasal" is a term often used to describe the voice quality or resonance patterns resulting when an individual cannot eliminate excessive nasal resonance from his vocal production, as in cleft palate speech. Recently, many of these same voice types have been described as being "denasal" or lacking in nasal resonance (Bzoch, 1964; Bench, 1968[1]; Boone, 1977). It would appear, then, that the differences between "hypo-nasal" and "hypernasal" are somewhat ambiguous or that the phenomenon of nasal resonance is somewhat vague.

In the normal speaker, the oral and nasal cavities are coupled to a high degree during the production of the nasal consonants /m/, /n/, and /ŋ/, this coupling often being carried over to adjacent vowels. "Vowel production in the English language is characterized primarily by oral resonance with only slightly nasalized components" (Boone, 1977, pp. 182-183). Shelton, Brooks, and Youngstrom (1964), in studying articulation patterns of normal speakers, expanded on this, saying that normal speech consists of some amount of nasal resonance on consonants other than nasal consonants. Therefore, a certain amount of nasal

[1]Bench, 1968--in personal discussion with him at the 1964 Montana Cleft Palate Conference, Dr. Ruel Bench stated that his associate, Dr. Charlene Hyde, found 50% or more cleft palate children to be judged as hyponasal rather than the expected judgment of hypernasal. Her dissertation was unavailable for further perusal.

resonance must be present for a voice to be described as normal. This, McDonald and Baker (1961) describe as a "resonance balance".

If we accept that normal speech consists of a resonance balance, then a resonance imbalance results in abnormal vocal production; that is, an amount of nasal resonance considered more or less than normal. For the sake of continuity throughout this study, a disorder of nasal resonance will be defined as a "resonance imbalance".

In the literature, speech pathologists appear to follow this reasoning, designating these disorders as either "increased" or "decreased" nasal resonance disorders. These two types of imbalance have been variously termed as follows:

"increased nasal resonance"	"decreased nasal resonance"
hyperrhinolalia	hyporhinolalia
rhinolalia aperta	rhinolalia clausa
	-anterior
	-posterior
nasal voice	denasal voice
hypernasal voice	hyponasal voice
positive nasality	negative nasality
open nasality	closed nasality
hyperrhinophonia	hyporhinophonia
nasal resonance	closed rhinophonia
nasal twang	adenoid speech
balbuties rhinismus	cold speech
open rhinophonia	stomatolalia

Increased Nasal Resonance

Most authorities discuss disorders of increased nasal resonance as being the result of excessive coupling of the oral and nasal cavities (Doob, 1948; Subtelny et al, 1961; West, Ansberry & Carr, 1957, Boone, 1977).

Robbins (1963, pp. 73-74) describes "nasality" somewhat

physiologically as the "pronunciation of sounds other than plosives and nasal consonants with the simultaneous lowering of the soft palate so that air passes out through the nose as well as through the mouth." Murphy (1964) and Arnold (1965) discuss increased nasal resonance as a modification of the glottal tone by the nasal chambers and as a distortion of all oral sounds. This type of imbalance of nasal resonance is then a change in the fundamental tone produced at the level of the glottis, the change taking place in the nasal chambers or naso-pharynx.

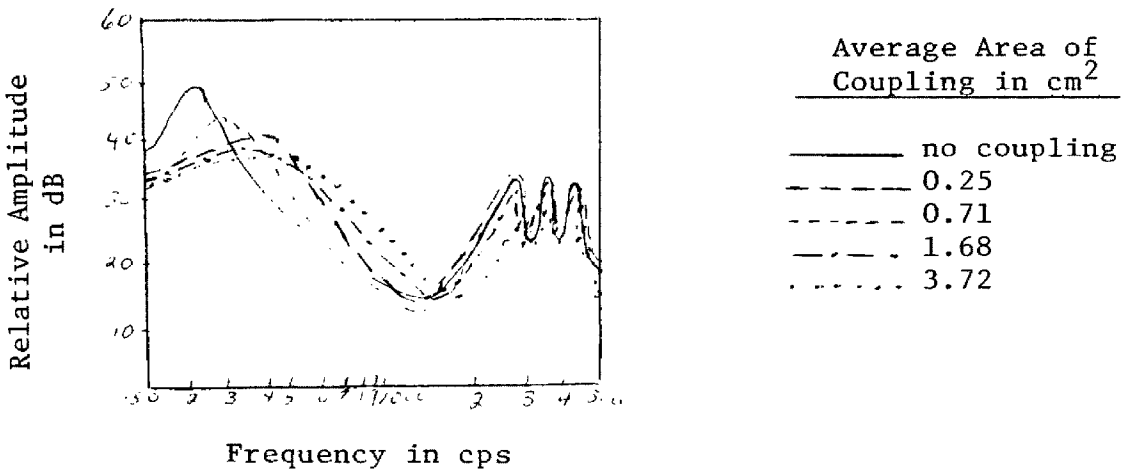
West et al (1957, p. 200) adds to this another rather different view in that this disorder is the result of ". . . imitation of those in the environment or because of indifference to standards of good speech . . . " However, the first ideas seem to be the most generally accepted.

Studies in the area of resonance disorders have been instrumental or perceptual, the latter being those in which a judge(s) will rate or describe the quality of the voice. Various phonetic factors affect the perceived nasal quality, usually due to the tongue movements which involve, for example, the palatoglossus muscle. This muscle, upon contraction, tends to pull the soft palate downwards, thereby increasing oral and nasal coupling. This effect is seen in the lingual placement for various vowel sounds. On vowels with a high lingual placement, such as /i/ and /I/, that muscle tends to contract, with a resulting judgment of increased nasal resonance. The opposite is true on low vowels such as /o/ and /ɔ/. This effect is less apparent on back vowels in which the posterior part of the tongue is more active than on the front vowels. (Spriestersbach and Sherman, 1967, pp. 101-102).

A vowel, then, carries a variable amount of nasal resonantion when produced in isolation. This amount is increased when the vowel is produced as part of a nasal consonant-vowel syllable (Kelly, 1934). This is apparently due to the relationship between the lingual and velar position following production of the consonant.

In addition to direct movements of the soft palate, various indirect factors also influence its movement and hence, judgments of the amount of nasal resonance present in a voice. For example, in conversational speech, pitch changes away from the individual's habitual pitch yield a judgment of increased nasal resonance. The individual's vocal intensity level has an inverse effect on nasal resonance; that is, as vocal intensity decreases, the judged amount of nasal resonance increases (Spriestersbach and Sherman, 1967, pp. 103-105).

Instrumental procedures eliminating the variability of the human listener have yielded a graphic description of vocal characteristics resulting from increased coupling of the oral and nasal passages. Spectographic tracings, without concern for pitch or intensity factors, have recently given us this instrumental description. A copy of one of these tracings, as shown below, shows that as the amount of coupling increases, there is increased damping in the resulting spectograph:



the normal production of /i/
from Spriestersbach and Sherman, 1967, pp. 101-102

Related Physiological Factors

It is in this area, perhaps, where most of the differentiation between the two disorders has taken place. Although it is generally accepted that increased nasal resonance is a result of increased oral and nasal coupling, many other factors have been found to influence the perceived amount of nasality.

Williamson (1944) examined 84 persons previously diagnosed by from one to ten experienced listener(s) as having positive or negative nasality and found those diagnosed as having positive nasality (an increase) had a "seemingly relevant" occurrence of: (1) general vocal inadequacy, (2) lacking breath control, (3) emotional problems, (4) chest and throat tensions, (5) tense jaw with limited oral cavity, (6) high displacement of the tongue on vowels, and (7) a sluggish velum. It is interesting to note that in this same study, all except (7) were also found to be significantly related to the hyponasal subjects.

Doob (1948) includes poor articulatory habits and poor muscle coordination as contributing factors to hypernasality. Murphy (1964, pp. 50-61) brings up the point that mouth opening is significantly related to hypernasality as have other writers. However, Buck (1953) stated that he found no evidence to support this.

Both Cotton (1940) and Murphy (1964) discuss the importance of muscle contraction and tension along the vocal tract as they relate to nasal resonance. Cotton says that, as the oral and pharyngeal muscles contract, the velum is pulled downwards which, if not properly coordinated, will affect the functioning of the soft palate. The necessity of their coordination can be seen in Morley's (1967) discussion of the type of sling functioning of the palatal muscles.

Kelly (1934), one of the earlier writers to publish in this area, summarized his thoughts on causes of hypernasal voice problems as (1) failure of the velum to complete occlusion, (2) too wide an opening between the velum and the pharyngeal wall, (3) complete occlusion, and (4) undue constriction in the nasal passages. The first two have been supported by the above writers, but the latter two deal with occlusion in the naso-pharynx or nasal passages, which are usually described as causes of decreased nasal resonance.

Zwitman, Sonderman, and Ward (1974) expand on this, describing velar movement and lateral wall movement as being on a continuum as well as inter-relating:

Velar Movement	Lateral Wall Movement
1) little or no movement	1) little or no movement
2) some movement	2) lateral walls fill lateral recesses
3) touch closure	3) lateral walls move mesially beyond the sides of the velum, but don't approximate
4) all of velum contacts	4) lateral walls approximate

In general, most causal factors related to hypernasality deal with an inefficiency of the velopharyngeal mechanism, primarily due to improper muscle action and incoordination, hampering its movement.

Decreased Nasal Resonance

Discussions of this type of disorder compare it to the speech of a person with a cold, resulting from a decrease in or lack of nasal resonance (Cotton, 1940; Arnold, 1965, p. 684; Harrington, 1950; Robbins, 1963). "Sometimes, there is excessive nasal resonance, hypernasality. Sometimes the normal nasal resonance for the nasal phonemes (m, n, ŋ) may be lacking. This is denasality." (Boone, 1977, p. 78).

Beighly (1943) describes the disorder generally, saying that it results from too little or improper resonance. A physiological delineation of it (West, Ansberry, Carr, 1957) is ". . . an obstruction which impedes the emission of sounds through the nasal cavities".

Arnold (1965) deals more specifically with the three nasal consonants-- "closed nasality . . . results from diminished resonance of the three nasal consonants or due to their complete replacement . . ." Van Riper (1955) also supports this idea, questioning whether a disorder of decreased nasal resonance is actually a disorder of voice, or an articulation disorder of the /m/, /n/, and /ŋ/. This question is based on his finding that samples of "denasal speech, when played backwards,

could not be differentiated from samples of 'lalling' speech." Boone (1977, pp. 190-191) supports this idea. "In the strictest sense, denasality could be categorized as an articulation substitution disorder".

Although there is an overabundance of definitions given for hyponasality, there is confusion concerning the acoustical properties of it.

Related Physiological Factors

Williams (1944) in the study previously mentioned, found the same factors present in hyponasality as he found in hypernasality, excepting "sluggish velum". In addition, he found those subjects with decreased nasal resonance often had a blocked passage.

Other deviations seen significantly often in persons judged to be hyponasal include enlarged tonsils and adenoids, irregular nasal septa (Harrington, 1950), tumors of the nose, ulcers of the soft palate, poor muscle coordination, congenital dyspraxia (Arnold, 1965), chronic inflammation of the nasal mucosa, chronic catarrah, and allergies (Greene, 1974).

Most of the above causal factors deal with an interference in the nasal chambers or nasal pharynx. However, some overlapping or confusion is seen between the physiological factors relating to hyponasality and those relating to hypernasality, as in Kelly's (1934) and Williamson's (1944) papers.

Methods of Study

Zwitman, Sonderman, Ward (1974) summarize the methods of studying nasal resonance; "Clinical analysis of velopharyngeal adequacy generally is accomplished by assessment of articulatory proficiency, judgment of

nasal quality and emission, and direct observation of the nasopharyngeal area (1974, p. 368). Evaluation, then, is subjective or objective; that is, listener judgment procedures or measurement through instrumentation. Kantner (1948, pp. 211-212) feels subjective methods are the most reliable, saying " . . . the final decision as to whether or not an individual is 'nasal' is still . . . to be reached only through someone's subjective judgment . . . . The amount of nasality . . . does not seem to be directly related to the amount of air escaping through the nose or to the degree of opening in the soft palate during phonation. Greene (1974), too, feels that there is disagreement in what constitutes nasality in spectrographic tracings.

Moll (1967) agrees that nasal voice quality is a perceptual dimension and therefore must be measured perceptually. This, he does on, comprises a test with the highest possible face validity.

Sherman (1954), in developing an improved method for judging voice quality, played taped samples of speech backwards, including in her subjects those previously diagnosed as having articulation errors, voice disorders of harshness and of increased nasal resonance, and disfluencies. She found that her judges were able to discriminate abnormality only on those with voice disorders. From this, she concluded that this backwards playing eliminated all factors of speech other than the quality of voice, constituting a more valid judgment of voice quality.

Problem

Individuals with disorders of nasal resonance have most often been divided into two groups--those with too little resonance (typically caused by nasal constriction) and those with too much resonance (usually related

to velopharyngeal insufficiency). Boone, Van Riper, Bzoch, Bench, and Skinner and Shelton have suggested that 'denasality' may not refer to a resonance disorder at all, or that this term may be applied to individuals who, in the past, have been described as hypernasal.

There are several terms given for these two disorders, describing them as though they were on opposite ends of a continuum. However, in the differentiation of them in the literature through study and experimentation, the two appear much more similar than this.

Based on Kantner (1948), Moll (1967), and Greene's (1974) philosophies that a voice quality judgment must be made perceptually, this study will attempt to determine how trained listeners classify the speech (voice) of four structurally differentiated groups on the basis of a nasality continuum. It will determine if a structurally denasal voice is heard as more or less nasal than either normal, nasal twang, or hypernasal voices, and if each differentiated group clusters in one area of the nasal continuum.

CHAPTER II

METHODS

Subjects

Three male subjects between the ages of 18 and 30 years were chosen for this study, all meeting the following criteria for inclusion:

1. no history of a voice problem.
2. at the time of voice recording, have no physical abnormalities affecting the voice, such as a cold, allergies, or laryngitis.
3. no hearing loss above 20 Hz in the speech frequencies.
4. be considered of normal voice by an experienced speech pathologist.
5. be second generation Americans from the Northwest area.

Speech samples of these three subjects were recorded under four different voice conditions to approximate four different voice qualities. Before each recording, three oral-pressure ratings were made on each subject to ascertain if they approximated the desired condition.

The first condition (C_1) was the recording of the subjects' normal speaking voice.

The second condition (C_2) simulated a hypernasal condition wherein the subjects could not attain velopharyngeal closure and received an oral breath pressure ratio of 0.5 or less on the oral manometer. A board-certified otolaryngologist first anaesthetized the soft palate with novocaine. One end of a straight rubber catheter was introduced through the nose into the nasopharynx, then grasped and pulled through the mouth, producing a sling-like effect on the soft palate. The catheter was held by the subject so as to pull the soft palate down and forward, rendering it immobile during speech.

The third condition (C_3) was an approximation of hyponasal voice in which the nasopharynx was blocked. The otolaryngologist introduced a Bard-Foley catheter with a 5 c.c. bulb through the nose and into the nasopharynx, with traction being made in the nasopharynx. The bulb, once in place, was inflated to 12 c.c. with water. In this condition, the bulb prevented the passage of any air through the nose. Normal oral pressure ratings were recorded by each of the subjects under this condition.

Condition four (C_4), was the imitation of a "southern twang" by the subjects following coaching by Dr. Evan Jordan, faculty member of the University of Montana, Department of Communication Sciences and Disorders. "In certain sections of the country, a variety of hypernasality is dialectic and of course in this setting it would not be a speech defect". (Van Riper, 1963). This, then, adds another dimension to a continuum of nasality, and is appropriate to this study.

Judges

Judges for this study included ten graduate students in speech pathology and/or audiology at the University of Montana with the same general training and experience in voice disorders. All were relatively naive concerning the purpose of this study.

Test Development

Samples of speech from the above subjects under the four conditions were recorded on a high fidelity tape recorder at a tape speed of 7½ inches per second for maximum fidelity of recording. Microphone placement was eight inches from the speaker's mouth to prevent the recording

of nasal emission of air. Playback of the tapes to the judges was made on a four-track tape recorder to allow for backwards playing of the speech samples.

Two passages were used for speech samples, which the subjects read for recording. The first, Passage A, was devoid of nasal consonants; and the second, Passage B, was representative of normal conversation, containing nasal consonants (see appendix). If a decrease in nasal resonance and thus slighting or substitution of nasal consonants is actually an articulation disorder as Van Riper suggests, the effect of misarticulated nasal consonants should be eliminated by the backwards playing (Sherman, 1954).

Under each of the four conditions, the subjects read Passage A continuously, recording of the test samples being taken during the tenth reading without the subjects' knowledge to insure a representative speech sample. The same procedure was followed for the recording of Passage B. In all, a total of twelve samples were recorded (three subjects X four conditions) for each passage.

For Passage A, the twelve samples were paired each with every other sample, and presented in random variation according to a procedure described by Ross (1934) which provides for each pairing to be made twice, positions of the members in the pair being reversed for the second presentation.

The preparation of the final tape to be presented to the judges was performed as follows:

1. the number of the pairing was recorded
2. the first member of the pair was presented (played backwards)
3. a one-second pause
4. the second member of the pair was presented

5. a five-second pause to allow the judges to make their decision. Each pairing followed this form. All speech samples were recorded backwards according to Sherman's (1954) method.

The same procedure was followed in the preparation of a separate tape for Passage B.

Procedure

The judges were first given a questionnaire to evaluate how they judged nasal resonance disorders, and their experience and education. Pretested instructions were then given to the judges in printed form for constant reference, then vocally. Following this, they were given a short initial practice to familiarize themselves with the procedure. The tapes were then presented to the judges. On a keyed sheet, they indicated which member of the pair sounded most nasal to them. Half of the judges were given Passage A first, followed by Passage B; the other half of the judges received them in reverse order to eliminate bias.

CHAPTER III

RESULTS

The data obtained from listener judgments were used to form a proportion matrix which gives the proportion of times that one stimulus was judged as "more nasal" than another stimulus. Thurston's Law of Comparative Judgments, Case V, as fully described in Guilford (1936, pp. 224-235; 1954, pp. 154-177), was then used with the proportions. Case V utilizes the assumption that all discriminal dispersions are equal. This allows the proportions to be translated into standard means (Z scores) which represent scale separations of the judged amount of nasality for each sample.

Case V of Thurston's Law allows discrepancies between the observed and theoretical proportions of no more than four times the standard error. Some of the values for Passage B were more than the allowed standard deviation, possibly for reasons outlined in chapter 4. Guilford advises eliminating those values; however, for comparison, data for Passage B is presented with (B_1) and without (B_2) those figures.

Table 1 shows the scale values for the four vocal conditions of the three subjects for both passages. With both Passage A (no nasal consonants) and Passage B (with nasal consonants), two subjects were judged as more nasal while under the denasal condition than under the normal condition.

In Passage A (no nasal consonants), denasal samples were judged as more nasal than some normal and hypernasal samples. Also, nasal twang was judged as more nasal than some hypernasal samples.

In Passage B (with nasal consonants), with all values included (B_1), again the denasal samples were consistently judged as more nasal than normal samples. The twang samples were again judged as most nasal, to an even greater degree.

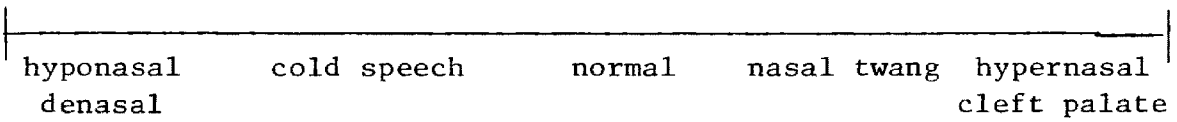
In Passage B_2, with significant differences eliminated according to Guilford's procedure, there was an inability to consistently judge normal from denasal. Again, twang tended to be judged as most nasal.

Comparison between the three passages show greater separations between samples when the passage contains nasal consonants than when the passage does not, indicating that the presence of nasal consonants increases the amount of perceived nasality, but that their presence is not necessary for consistent judgments of nasality to be made. Also, in both passages, there was no clear separation of normal and denasal samples; nasal twang was consistently judged as more nasal than the hypernasal samples.

Table 2 lists the conditions in ascending order according to their scale values. Again, it can be seen that samples do not separate into distinct and isolated groupings of denasal, normal, nasal twang, hypernasal, on a continuum, as the literature suggests.

Table 3 utilizes the mean of the three scale values for each vocal condition for comparison with other vocal conditions. Again, the scale separations between conditions become greater when the passage contains nasal consonants, but do not change the order rankings except in the case of Passage B_1 where normal voice is judged as least nasal. In all three conditions, nasal twang is judged more nasal than hypernasal.

Another interesting feature was that, before presenting the test samples to the judges, they were asked to outline their experience and training. Then they were given the following words: hypernasal, hyponasal, cleft palate speech, denasal, nasal twang, normal, and "cold" speech (re: congestion); and asked to place them in a continuum of nasality. Not one judge expressed any difficulty with this task, and with few variations, they placed them as follows:



Exceptions to this were two judges who place nasal twang below normal in nasality, and one judge who placed "cold" speech between normal and nasal twang. The judges apparently felt they could delineate voice disorders into particular groupings. Test results show that they were not able to do so with the consistency they anticipated.

TABLE I

SCALE VALUES FOR 4 VOCAL CONDITIONS OF 3 SUBJECTS,

USING SPEECH SAMPLES WITH AND WITHOUT NASAL CONSONANTS

PASSAGE A

(NO NASAL CONSONANTS)

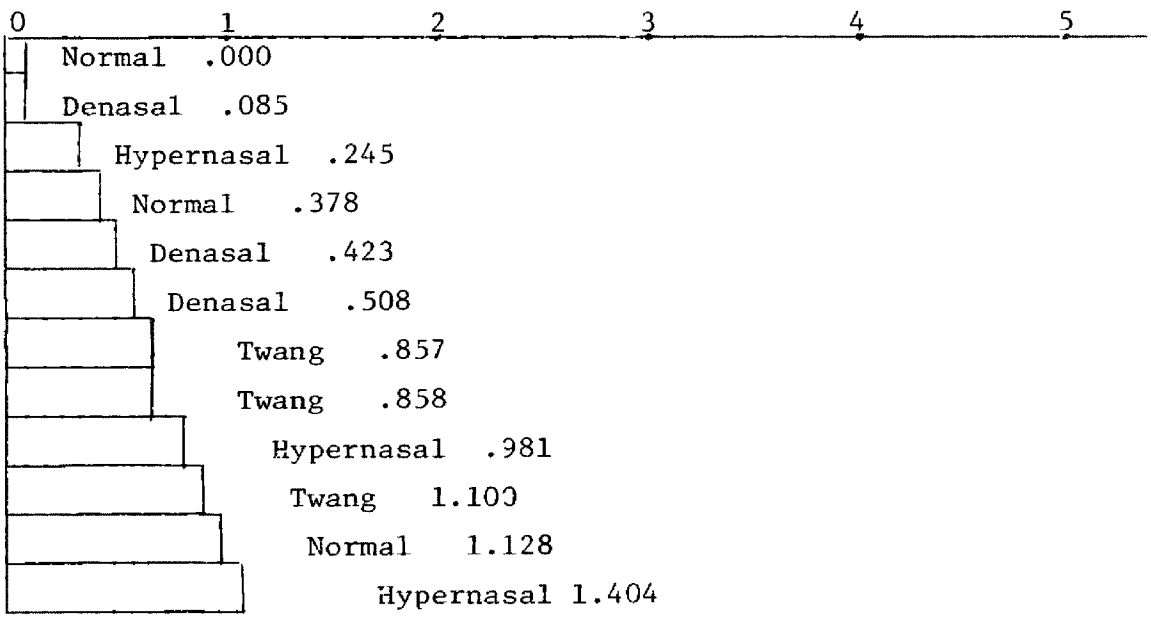


TABLE II

SCALE VALUES FOR 4 VOCAL CONDITIONS OF 3 SUBJECTS,

USING SPEECH SAMPLES WITH AND WITHOUT NASAL CONSONANTS

PASSAGE B_1

(NASAL CONSONANTS ALL VALUES INCLUDED)

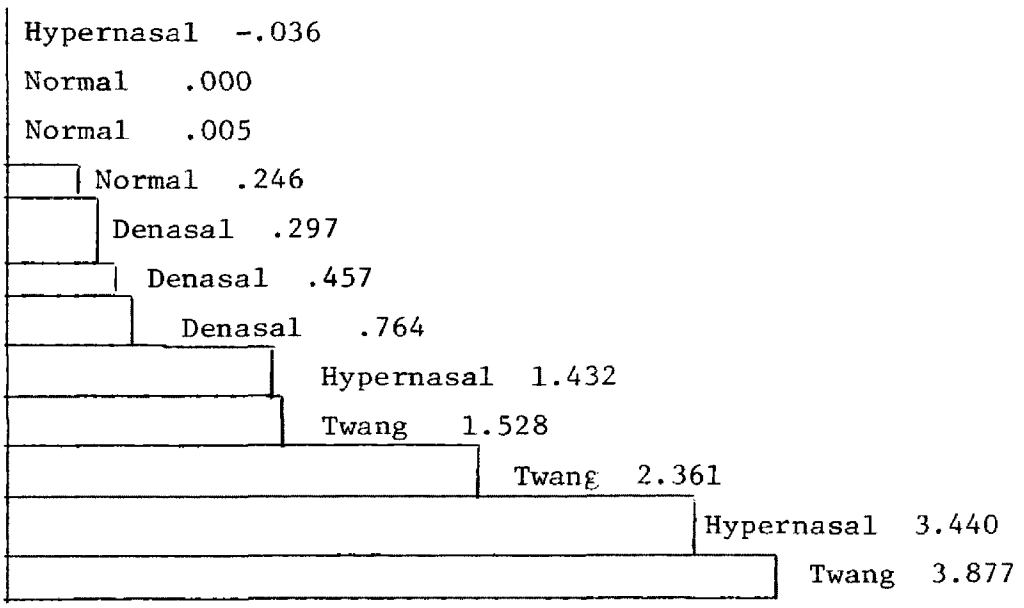


TABLE III

SCALE VALUES FOR 4 VOCAL CONDITIONS OF 3 SUBJECTS,

USING SPEECH SAMPLES WITH AND WITHOUT NASAL CONSONANTS

PASSAGE B_2

(NASAL CONSONANTS SIGNIFICANT DIFFERENCES ELIMINATED)

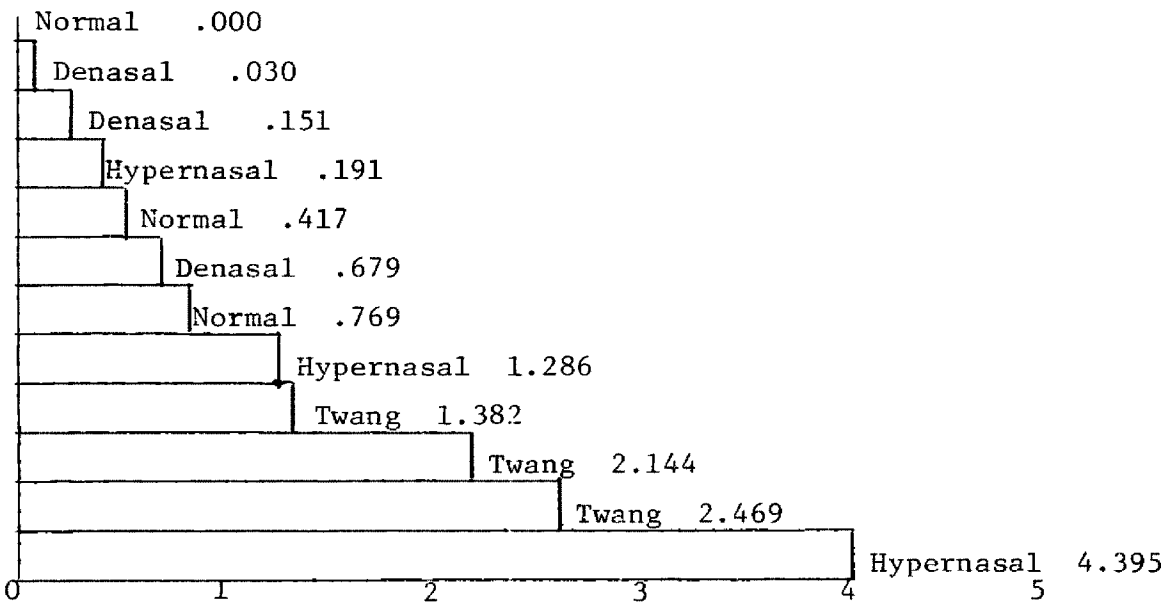


TABLE IV

INDIVIDUAL RANKINGS OF 3 SUBJECTS UNDER 4 VOCAL CONDITIONS

USING SPEECH SAMPLES WITH AND WITHOUT NASAL CONSONANTS

	Passage A (no nasal consonants)	Passage B_1 (with nasal consonants, all values included)	Passage B_2 (with nasal consonants, some values eliminated)
judged least nasal			
	Normal	Hypernasal	Normal
	Denasal	Normal	Denasal
	Hypernasal	Normal	Denasal
	Normal	Normal	Hypernasal
	Denasal	Denasal	Normal
	Denasal	Denasal	Denasal
	Twang	Denasal	Normal
	Twang	Hypernasal	Hypernasal
	Hypernasal	Twang	Twang
	Twang	Twang	Twang
	Normal	Hypernasal	Twang
	Hypernasal	Twang	Hypernasal
judged most nasal			

TABLE V

MEAN SCALE VALUES FOR 4 VOCAL CONDITIONS, USING SPEECH SAMPLES WITH AND WITHOUT NASAL CONSONANTS

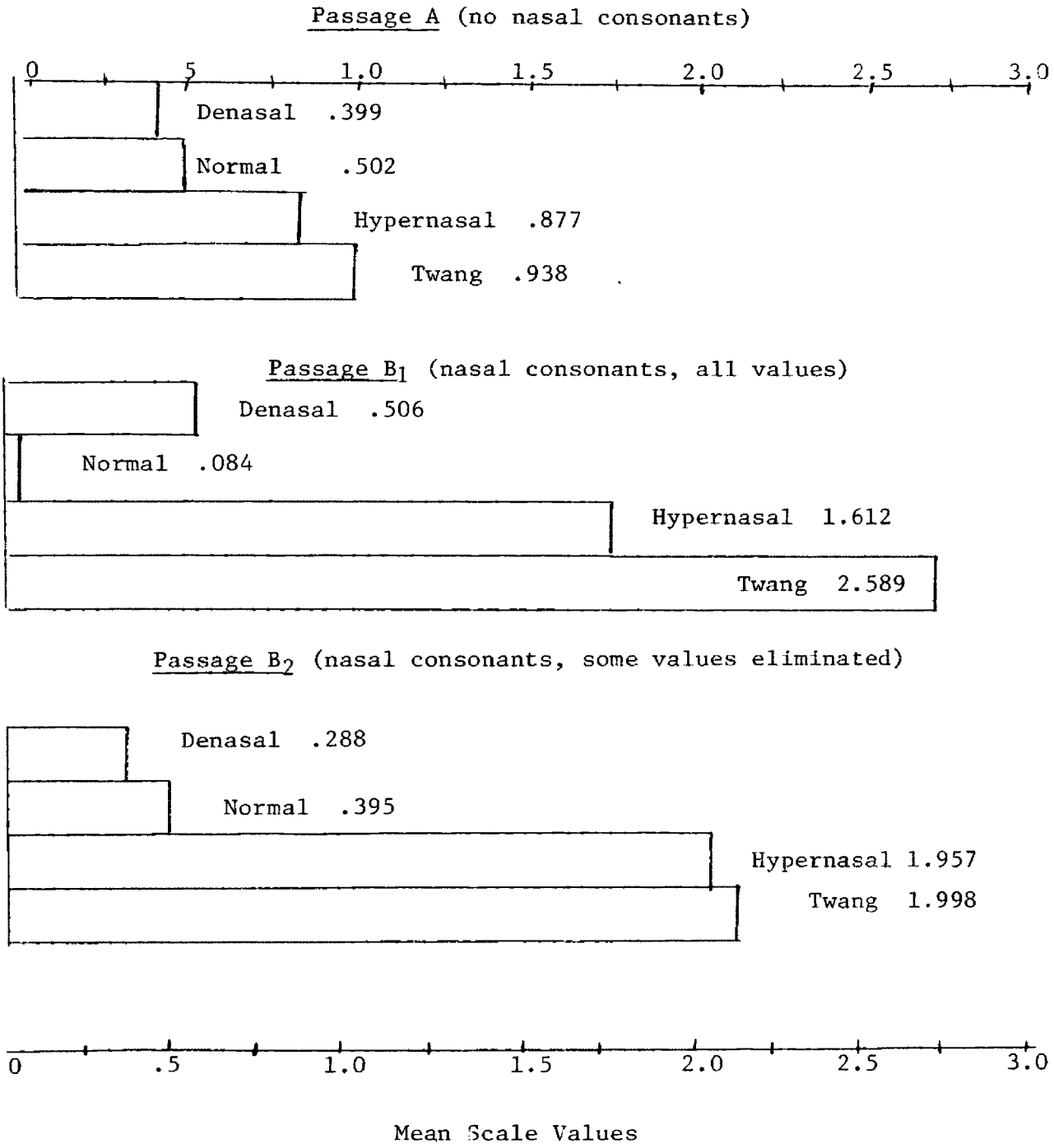
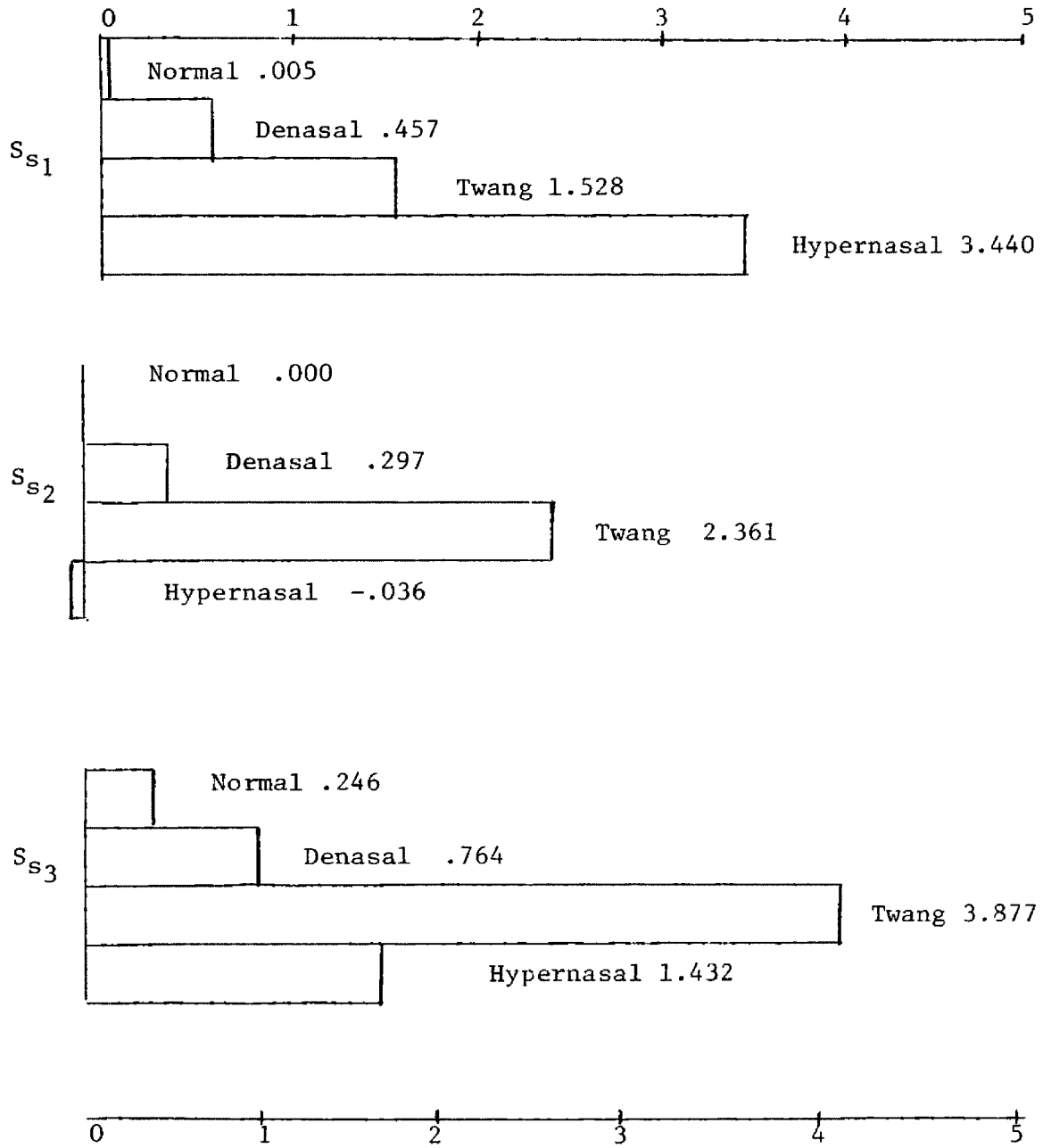


TABLE VI

VALUES FOR EACH SUBJECT UNDER 4 VOCAL CONDITIONS,

USING SPEECH SAMPLES WITH NASAL CONSONANTS (B_1)



CHAPTER IV

DISCUSSION

The original purposes of this paper were to see if judges would separate the voice samples of four structurally differentiated groups into the accepted continuum of nasality, namely denasal - normal - nasal twang - hypernasal; and to see if, as suggested by Boone, Van Riper, et al, denasality might be classed as an articulation disorder.

Some comments concerning the testing procedure should be made. Regarding the subjects, the conditions they were subjected to in order to simulate the particular physiological conditions ranged from uncomfortable to painful. In some instances, the subjects were so uncomfortable that they tended to read the given passage more quickly than other subjects. With certain subjects, the voice they produced under particular conditions was abnormal enough to skew the results. For example, one subject under the hypernasal condition was judged as being considerably more nasal than either of the other subjects. Regarding the judges, making the 132 judgments required was tedious and time consuming. Three judges in particular expressed hostility at having participated. All expressed some difficulty in discriminating between some pairs. However, a review of the literature on the method of pairing and judging showed this to be a common comment, but did not reflect on the validity of the procedure. Indeed, Ross (1934) found that making numerous rapid decisions added to the validity of the procedure by eliminating extraneous features.

As can easily be seen from the tables presented, the voice samples

did not fall into the four clearly separated groups the literature has described. Rather, the samples often appeared randomly placed in the continuum. Normal was often judged less nasal than the denasal condition. This scatter of samples is significant in that, whether there were nasal consonants in the sample or not, the judges did not consistently designate increased nasality to particular physiological conditions. This is opposed to what they felt they could do when they were questioned before the test.

If we do not adhere strictly to Guilford's procedure eliminating all significant differences, the groupings become normal - denasal - hypernasal - twang. This also is not the ranking either the judges or the literature predicted.

Also of interest is that nasal twang was consistently judged as being most nasal, even more so than the hypernasal condition. And yet, as Van Riper says, it is not considered to be a speech defect, as hypernasality would be. Various possibilities for the judging of nasal twang as 'most nasal' come to mind, such as increased nasality on all phonemes under the twang condition, or the effects of assimilation nasality with the twang condition. Also to be considered is that, in the hypernasal condition, the soft palate was rendered non-functional by pulling it forward. This perhaps produced more nasal emission than nasal resonance.

In conclusion, it can be said that, although there are tendencies, judges do not consistently categorize voices into four separate groups on a continuum of nasality. And perhaps more importantly, they often hear denasality as being more nasal than normal voice.

Another issue to be addressed is whether denasality can be classified as an articulation problem, rather than as a voice problem. If denasality is an articulation disorder of the phonemes /m/, /n/, and /ŋ/, then whether or not nasal consonants are included in the speech samples, the judgments of denasality should be about the same for both passages. Also, inclusion or lack of inclusion of nasal consonants should have little effect on the rank ordering of samples. When the means of the two passages under the denasal condition are compared, .395 for Passage A and .288 for Passage B_2, there is no significant statistical difference.* With the rank ordering of the scale values for both passages, there is no consistent difference in order. It would seem appropriate, then, to describe denasality as an articulation disorder of the three nasal consonants.

Certainly, both these issues indicate areas for further study. How much effect does the vowel content of the sample have on the amount of perceived nasality? How do judges hear the voices of people with true structural deviations? Why was nasal twang consistently judged as most nasal? However, we do know, now, that denasal voice is rarely heard as "denasal" or lacking in nasal resonance, but is most often heard as having more nasal resonance than normal voice.

*t-test showed no significant difference at .05 level of confidence.

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APPENDICES

Passages read by subjects and recorded for backwards playing to the judges: Passage A (devoid of nasal consonants on recorded part).

In the fall, many changes takes place in our environment. The days become shorter, and the sun is not as hot. Leaves on the trees become dry and change color. *These leaves start to fall to the earth as they are without water; thus they die of thirst*. In the spring, new buds form on the branches, and new leaves grow.

Passage B (normal amount of nasal consonants)

In earlier times, one's parents would be inclined to punish undesired behavior. *Now, our nation's psychologists emphasize the necessity of our children's deviations from* currently accepted behavioral norms. Although they claim they don't expect every parent to be a psychologist, they feel parents are now better able to understand through reading and education.

*indicates the particular phrase which was recorded.

Judges Questionnaire

1. What types of voice cases have you worked with, either in the clinic or out?

2. What courses have you had that would have prepared you to any degree to make these types of voice judgments?

3. From this study, we hope to determine how listeners perceive nasality in its various degrees. If you were to form a continuum of nasality, show where you would place the following:

   a. hypernasal
   b. hyponasal
   c. cleft palate speech
   d. denasal
   e. nasal twang (indicative of some states)
   f. normal
   g. cold speech (congestion)

Name: _____

State Residency: _____ Years: _____

Mother's Residency: _____

Father's Residency: _____

Academic Level: _____

Professional Experience: Years _____

Type _____

Instructions for Judges

You have been asked to participate in this study as a judge. Samples of speech have been taped in pairs for presentation to you in a backwards fashion. Before each pair, its number will be heard. Find this number on your score sheet. Listen to the two samples of speech and determine which sounded most nasal to you. Mark a "1" in the position of this sample beside the pair number. Leave the other space blank. Again, use a "1" to indicate the most nasal sample of the two. Be sure you are marking it for the correct pair.

e.g.	20.	___	1
	21.	1	___
	22.	1	___
	23.	___	1
	24.	___	1